

RESPONSE AFTER FINAL – EXPEDITED PROCEDURE – GROUP 1713**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Patent Application of:
Yoshiki Nakagawa, et al.

Application No.: 09/719,580

Group Art Unit: 1713

Filed: March 9, 2001

Examiner: T. Zalukaeva

For: PROCESS FOR PRODUCING BRANCHED
POLYMER AND POLYMER

RESPONSE TO FINAL OFFICE ACTION UNDER 37 CFR 1.116

Commissioner for Patents
Box AF
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Alexandria, VA 22313-1450

Dear Sir:

This is in response to the Office Action dated September 27, 2004.

Claims 1, 3, 5-8, 10-17 and 20-38 are now in the application.

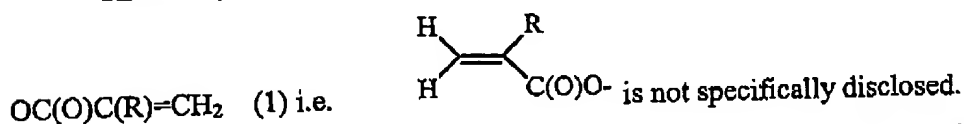
Claims 1, 3, 5, 10-17, and 20-37 were rejected under 35 U.S.C. 103(a) as being obvious over EP 0357036 (herein after also referred to as EP'036). EP'036 does not render these claims obvious.

Concerning claim 1 and claims dependent therefrom, EP'036 suggests a method for preparing a macromonomer, comprising conducting anion living polymerization of methyl methacrylate, etc. and successively reacting the resultant intermediate with a halogen containing vinyl compound. See page 3, line 3 from the bottom to page 4, line 1, and page 6, lines 25-29.

As the halogen containing vinyl compound, specifically disclosed is p-vinylbenzyl bromide on page 6, line 36.

Further, in Synthesis Example 1, anion living polymerization of methyl methacrylate is discussed by using vinylphenylketene-trimethylsilyl acetal as an initiator to obtain an styryl-containing polymethacrylate on page 7, line 55 to page 8, line 10.

Therefore, the claimed macromonomer having the group of formula (1) -



This group of formula (1) is highly polymerizable as compared to the vinyl group derived from p-vinylbenzyl bromide or vinylphenylketene-trimethylsilyl acetal. During anion living polymerization, therefore, the group of formula (1) might easily raise some side reactions. It is thus quite difficult to obtain a macromonomer having the group of formula (1) at high ratio by anion living polymerization.

EP'036 suggests only a method of preparing a macromonomer having said vinyl group, but not the group of formula (1).

EP'036 does not disclose the claimed macromonomer terminally having the group of formula (1), and does not disclose any method of preparing a macromonomer terminally having the group of formula (1) at high ratio.

According to the present invention, it is possible to readily obtain a branched polymer in which the molecular weights of its branched chains are uniformly controlled.

As described on page 6, lines 25-40, and in Synthesis Example 1 on page 7, line 56 to page 8, line 10 of EP'036, living anion polymerization requires a very controlled polymerization condition at a low temperature and high vacuum by using a dehydrated solvent. Thus the living anion polymerization is not suitable for use in the industry.

On the contrary, the living radical polymerization according to the present invention, which does not require so strictly controlled condition, is suitable for use in the industry.

Concerning claims 20 and claims dependent thereon, the effect of the present invention is described on page 36, lines 3-10 of the instant specification as follows:

When the macromonomer is polymerized by living radical polymerization, the molecular weight and molecular weight distribution of the resulting polymer chain can be controlled. As a result, when it is copolymerized with another monomer, graft copolymers better controlled with

respect to the number of arms of a stellar polymer as compared with ordinary free radical polymerization can be obtained.

On the contrary, the invention disclosed by EP'036 has an object to provide a method for the preparation of a comb copolymer having high ratios of the macromonomers, which constitutes the branch part of the comb polymer, by using bulk polymerization or suspension polymerization; and to provide a manufacturing method which can prepare a comb copolymer having a high molecular weight by the solution polymerization. Please see page 2, lines 40-50, and page 3, lines 1-5.

Further, EP'036 describes that the copolymerization is most readily and preferably carried out by radical polymerization on page 7, lines 4-5.

However, EP'036 does not suggest or provide motivation to arrive at the present invention, i.e. living radical polymerization of a macromonomer terminally having the group of formula (1) in order to obtain a branched polymer in which the molecular weight and molecular weight distribution of its branched chains is controlled.

Claims 1, 3, 5-8, 10-17, and 20-38 were rejected under 35 U.S.C. 102(b) as being anticipated by or under 35 U.S.C. 103(a) as being obvious over U.S. Patent 5,483,003 to Siol et al. (herein after also referred to as "Siol"). Siol fails to anticipate and to render obvious the above claims.

Concerning the rejection based upon anticipation, as a method for preparing a macromonomer, Siol suggests anionic and cationic living polymerization techniques, and radical polymerization on column 3, line 5-7. However, Siol does not specifically disclose or even remotely suggest the living radical polymerization according to the present invention.

Therefore, Siol does not anticipate the present invention.

Siol fails to anticipate the present invention. In particular, anticipation requires the disclosure, in a prior art reference, of each and every recitation as set forth in the claims. See *Titanium Metals Corp. v. Banner*, 227 USPQ 773 (Fed. Cir. 1985), *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 1 USPQ2d 1081 (Fed. Cir. 1986), and *Akzo N.V. v. U.S. International Trade Commissioner*, 1 USPQ2d 1241 (Fed. Cir. 1986).

There must be no difference between the claimed invention and reference disclosure for an anticipation rejection under 35 U.S.C. § 102. See *Scripps Clinic and Research Foundation v.*

Genetech, Inc., 18 USPQ2d 1001 (CAFC 1991) and *Studiengesellschaft Kohle GmbH v. Dart Industries*, 220 USPQ 841 (CAFC 1984).

To the extent that the Examiner is relying upon inherency, this is improper. Inherency requires that the recited results or structure must necessarily be obtained not merely that it might be achieved. See *Electra Medical Systems S.A. v. Cooper Life Sciences, Inc.*, 32 USPQ2d 1017 (Fed. Cir. 1994); *In re Oelrich*, 212 USPQ 323 (CCPA 1981) and *In re Robertson*, 49 USPQ2d 1949 (Fed. Cir. 1999).

With respect to claim 1 and claims dependent thereon and the rejection based upon obviousness, according to the living radical polymerization, it is possible to obtain a macromonomer showing a narrow molecular weight distribution and terminally having the group of formula (1) at high ratio. Therefore, the production method according to the present invention makes it possible to obtain a branched polymer in which the molecular weights of its branched chains are uniformly controlled.

On the contrary, the macromonomer suggested by Siol, which is prepared under free, not "living", radical polymerization, shows a broader molecular weight distribution. Therefore, Siol never achieves a branched polymer in which the molecular weights of its branched chains are uniformly controlled.

In the "living radical polymerization" according to the present invention, terminally inactivated molecules and terminally active molecules both grow in a state of equilibrium. See page 10, lines 20-22 of the instant specification. This is quite different from the "free" radical polymerization.

Furthermore, the ionic, i.e. anionic and cationic, living polymerization is quite different from the living radical polymerization in view of their reaction mechanisms.

Although it is stated in the office action that such explanation is also pertinent to living radical polymerization(see page 4 of the outstanding Office Action), it cannot be considered that the description in Siol which was referenced in the office action can also apply to living radical polymerization. Siol does not describe or make such suggestion.

Concerning claims 20 and claims dependent thereon, an objective of the suggestions of is to devise TPEs which have the desired optical properties, particularly transparency. See col. 1, lines 49-52 thereof. As the comb polymer contained in the TPEs, Siol describes a comb polymer

having optical properties, particularly high transparency, and its production method on col. 3-5, and the Examples on col. 6.

However, Siol does not suggest or provide motivation to arrive at the present invention, i.e. living radical polymerization of a macromonomer terminally having the group of formula (1) in order to obtain a branched polymer in which the molecular weight and molecular weight distribution of its branched chains is controlled.

Claims 1, 3, 5-8, 10-17, and 20-38 were rejected under 35 U.S.C. 103(a) as being obvious over U.S. Patent 5,807,937 to Matyaszewski. Although in the office action, this rejection refers to 35 U.S.C. 102(a), the rejection is actually under 35 U.S.C. 103(a) as confirmed during a telephone call with the Examiner. Matyaszewski fails to render obvious the above claims since, among other things, Matyaszewski does not suggest a vinyl polymer having at least one terminal group of the formula

$$-CO(O)CR=CH_2.$$

In particular, the present invention according to claims 1 and 20 and claims dependent thereon is directed methods for preparing vinyl polymers having at least one terminal group of formula (1); $-OC(O)C(R)=CH_2$.

That is, the vinyl polymer has a terminal group of $-OC(O)C(R)=CH_2$.

Page 5, lines 4-6 of the Office Action states as follows: "It is taught by Matyaszewski that one can select an initiator that provide the same structure as a repeating polymer unit, by citing lines 65-67 in col. 38." However, Matyaszewski does not disclose what type of initiator can succeed in providing a vinyl polymer with a terminal group of $-OC(O)C(R)=CH_2$, and from the suggestions in Matyaszewski that such is not obvious. For instance, assuming that an acryloyl group-containing compound is used as the initiator, together with an acrylate monomer, the claimed vinyl polymer having a terminal group of $-OC(O)C(R)=CH_2$ cannot be obtained.

If the acryloyl group-containing compound is used as the initiator for carrying out the suggested atom transfer radical polymerization, the acryloyl group in the initiator will be completely consumed during the polymerization and thus no carbon-carbon double bonds from the acryloyl group remain in the product. This is because the acryloyl group is highly reactive in the atom transfer radical polymerization. Thus, the resulting polymer cannot retain an acryloyl group derived from the initiator.

Further, Matyaszewski fails to enable a skilled person to obtain the claimed polymer having a terminal group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ by selecting an initiator that provides the same structure as a repeating polymer unit. Therefore, the general description indicated below of Matyaszewski would not render the claimed polymer obvious. Along these lines, the Examiner's attention is kindly directed to page 25 et seq. wherein the various techniques for providing the claimed functional groups is disclosed.

In addition, page 5, lines 9-12 of the Office Action, states as follows: "Matyaszewski discloses a variety of suitable polymers, ..., terminated by a variety of functional groups, including acryloyl groups, as can be derived from the meaning of X explained through the whole body of a patent." Contrary to this statement, however, Matyaszewski does not disclose the claimed group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ in the definition of X. On col. 17, lines 23-32, X is defined, in which the claimed group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ is not mentioned at all.

The " $\text{OC}(=\text{O})\text{R}^{14}$ " group on col. 17, line 24 differs significantly from the claimed group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ because the group R^{14} is clearly defined as aryl or a straight or branched C1-C20 alkyl group (see col. 16, lines 27-28). Persons skilled in the art would not interpret the aryl or alkyl group as meaning a vinyl group.

Thus, it is clear that the claimed group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ does not fall within the range of the disclosed " $\text{OC}(=\text{O})\text{R}^{14}$ ".

Further, even assuming arguendo, that R^{14} represents a vinyl group, the claimed vinyl polymer having a group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ would still not be obtained because X on col. 17 is disclosed as part of initiator, and such initiator having the assumed $\text{OC}(=\text{O})\text{R}^{14}$ group will be completely consumed during the polymerization reaction. Therefore no carbon-carbon double bonds in the vinyl group remain in the product as explained above and mentioned during the telephonic interview.

Furthermore, page 5, lines 14-17 of the Office Action, states as follows: "It is further taught by Matyaszewski that the end functionality of polymers can be easily converted to other functional groups, and initially containing CO_2R group is identified as an initial functional group."

The CO_2R group is described on col. 39, line 17 of Matyaszewski. Further Matyaszewski states on col. 39, lines 20-21 that CO_2R can be hydrolyzed to form a carboxylic acid, $-\text{CO}_2\text{H}$, by known processes.

From this description of the formation of a carboxylic acid, it is apparent to those skilled in the art that the CO_2R group means $-\text{C}(=\text{O})-\text{O}-\text{R}$. Thus, the ester group in the CO_2R group is in the opposite direction from that in the claimed group of $-\text{O}-\text{C}(\text{O})\text{C}(\text{R})=\text{CH}_2$.

In this context, it is clear that Matyaszewski does not disclose the group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$.

Page 5, lines 18-20 of the Office Action, states as follows: "the end functionality of the copolymers of Matyaszewsk can be easily converted to other functional groups."

Matyaszewski merely describes that the end functionality of the copolymers of Matyaszewski can be easily converted to "other functional groups", and exemplified OH , NH_2 , a carboxylic acid, a carboxylic acid halide as said "other functional groups". Contrary to this statement, Matyaszewski does not describe the end functionality of the copolymers of Matyaszewski can be converted to acryloyl groups. On the other hand, the present specification clearly discloses how to achieve the claimed polymers including acryloyl groups by any conventional and known methods, by citing col. 39, lines 15-25 (see page 25 et seq. of the specification).

The claimed group of $-\text{OC}(\text{O})\text{C}(\text{R})=\text{CH}_2$ is not obvious over the description "other functional groups" in Matyaszewski.

The cited art lacks the necessary direction or incentive to those of ordinary skill in the art to render under 35 USC 103 sustainable. The cited art fails to provide the degree of predictability of success of achieving the properties attainable by the present invention needed to sustain a rejection under 35 USC 103. See *Diversitech Corp. v. Century Steps, Inc.* 7 USPQ2d 1315 (Fed. Cir. 1988), *In re Mercier*, 185 USPQ 774 (CCPA 1975) and *In re Naylor*, 152 USPQ 106 (CCPA 1966).

Moreover, the properties of the subject matter and improvements which are inherent in the claimed subject matter and disclosed in the specification are to be considered when evaluating the question of obviousness under 35 USC 103. See *Gillette Co. v. S.C. Johnson & Son, Inc.*, 16 USPQ2d. 1923 (Fed. Cir. 1990), *In re Antonie*, 195, USPQ 6 (CCPA 1977), *In re Estes*, 164 USPQ (CCPA 1970), and *In re Papesch*, 137 USPQ 43 (CCPA 1963).

No property can be ignored in determining patentability and comparing the claimed invention to the cited art. Along these lines, see *In re Papesch, supra*, *In re Burt et al.* 148 USPQ

548 (CCPA) 1966), *In re Ward*, 141 USPQ 227 (CCPA 1964), and *In re Cescon*, 177 USPQ 264 (CCPA 1973).

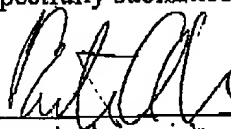
In view of the above, consideration and allowance are, therefore, respectfully solicited.

In the event that the Examiner believes an interview might serve to advance the prosecution of this application in any way, the undersigned attorney is available at the telephone number noted below.

The Commissioner is hereby authorized to charge any fees or credit any overpayment associated with this communication including any extension fees to Deposit Account No. 22-0185.

Dated: 3-25-05

Respectfully submitted,

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